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The distribution of temperature in the waters of Long Island Sound, Block Island Sound, and Newport Bight. Cruise STIRMI - III, January - February 1952.

by

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The data presented in this report were obtained during January and February 1952 on Cruise STIRMI - III of the project. Figure 2 includes the locations at which the data were obtained, as well as the locations of the vertical sections presented in Figures 3 through 6.

On February 7th a break-down of one of the ship's engines interrupted the sequence of observations. Work was resumed on February 16. Since the heaviest storms and most turbulent sea conditions of the cruise period had occurred prior to this break, it is considered that reasonably little error is introduced by treating the data synoptically.

Only the four westernmost stations of the cruise were taken with regard to tidal time. These were occupied at slack before flood and at slack before ebb to determine the tidal displacement of the surface temperature values.

The surface isotherms presented in Figure 1 were drawn from combined STD and station values.

OBSERVATIONS

Surface temperatures (Fig. 1) increased from west to east. They reached a high of 44.5° F between Montauk Point and Block Island (this value was obtained during the flood tide). From Block Island southward there was a steady increase in surface temperature until 44° F was reached at about 41° N latitude. Between Block Island and Martha's Vineyard the surface temperature varied erratically between 43.5° and 38° F.

Along the north shore of Long Island Sound cold (36°-36.5° F) waters were noted near the mouth of the Connecticut River and that of the Housatonic River. The cold water lens off the mouth of the Connecticut was especially prominent.

In the western half of Long Island Sound warmer water (37°-37.5° F) extended further westward in mid-Sound than along the north shore.

Figures 3, 4, and 5 present the vertical distribution of temperature in sections in Newport Bight, Block Island Sound, and Long Island Sound respectively. The temperature pattern in all the sections is either one of water isothermal from top to bottom or one of progressive warming from the surface downward.

In Figure 5 sections G-G', which compare slack before flood with slack before ebb in the westernmost portion of the Sound, show that temperatures were slightly higher at slack before flood (at the end of New York Harbor's ebb).

Sections H-H', J-J' and KK-K in Block Island Sound and all the sections in Long Island Sound (Fig. 5) show warmer water either at the bottom or from surface to bottom in their north-central parts.

Figure 6 covers the entire survey area longitudinally. The distributions of temperature in sections F-F' and D-D' closely resemble each other, especially so in Long Island Sound. Section D-D' has higher values and somewhat more complicated structure at the eastern end of the section, for it extends further eastward and thus further seaward than section E-E'.

DISCUSSION

The vertically isothermal temperatures throughout the area are to be expected during the months of January and February. They result from cold winds cooling the water at the surface and mixing it more or less completely from top to bottom. Sections which show a progressive warming from the surface downwards were, as a rule, of greater depth and usually crossed trenches or slopes at depths where the mixing effect of winds might well be materially reduced.

Comparison of these data with those of Riley (1948, Fig. 2) reveals, in both, the same general eastward warming and warm water areas near the bottom. The only significant difference between these data and Riley's is a few degrees of overall temperature difference. In midwinter of 1952 the waters of the area were uniformly 3-4° F warmer than in midwinter 1946. This is believed to be chiefly a reflection of the relative severity of the winters on which the cruises were made.

The distribution pattern of surface temperature observed on this cruise is in good agreement with that of the surface salinity (Status Report No. 21 of this project) and also with the composite diagram of surface currents shown by Riley (1952, Figure 10).

Using temperature as a water characteristic, and assuming that (regardless of the salinity) movement of water will bend isotherms

in the direction of its movement, the distribution of surface temperatures appears to indicate a counterclockwise motion west of 73° W in Long Island Sound. It also indicates a probable clockwise motion between 73°30' and 73°45' W. The cold lens off the Connecticut River may well lie in a clockwise eddy as suggested by Riley (1952). If salinity be assumed to be reasonably constant and density to depend primarily upon temperature, the same pattern of circulation is obtained.

Inward flow of salt water into Long Island Sound is indicated by the warmer water at the bottom in sections KK-K, L-L', M-M', N-N', O-O', and P-P'.

The tendency of the warmest water (sections KK-K, N-N', P-P') or the next-most-warm water (sections L-L', M-M') to extend isothermally from surface to bottom in the north-central portion of the Sound is considered to be an indication that the inflow of salt water into the Sound is, in winter, not entirely a subsurface inflow. This matter was discussed in some detail in Status Report No. 11 of this project.

LITERATURE CITED

Riley, Gordon A.
1948. Hydrography of the Western Atlantic; The Long Island and Block Island Sounds. Woods Hole Oceanographic Institution, Woods Hole, Mass. Technical Report No. 11 Fig. 2.
1952. Hydrography of the Long Island and Block Island Sounds. Bull. Bingham oceanogr. Coll., 13 (3): Fig. 10

Cornell University, Project Reports:
1952. Status Report No. 21. The distribution of salinity in the waters of Long Island Sound, Block Island Sound, and Newport Bight. By John C. Ayers and William D. Stockton. pp. 4-6 and Fig. 1.

Legend

Figure 1. Surface Temperature, degrees Fahrenheit, in Long Island Sound, Block Island Sound, and Newport Bight, Cruise STIRNI - III, January - February, 1952.

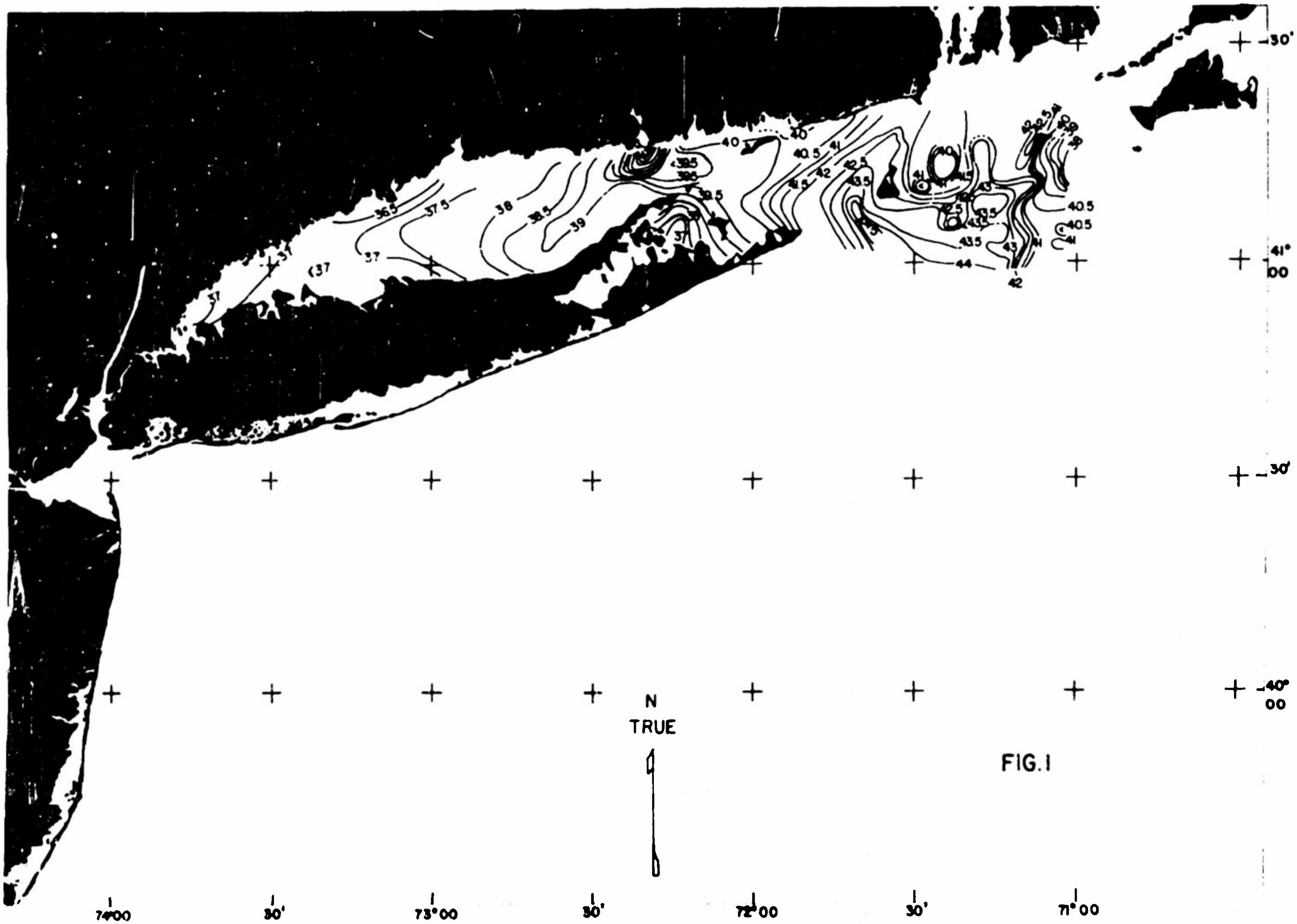


FIG. I

Legend

Figure 2. Location of stations and vertical sections in Long Island Sound, Block Island Sound, and Newport Bight, Cruise STIRNI - III, January - February, 1952.

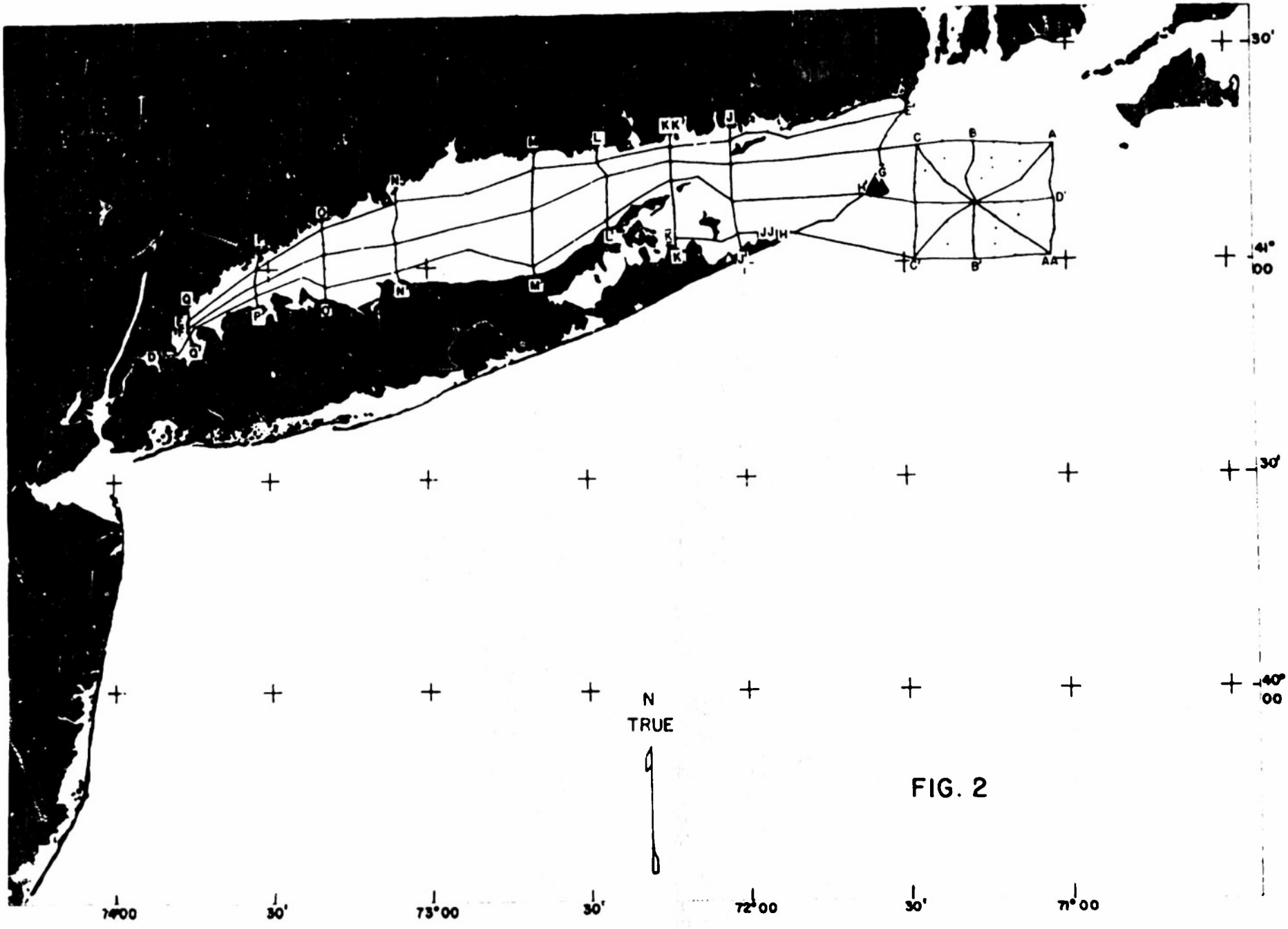


FIG. 2

Legend

Figure 3. Vertical Distribution of Temperature, degrees Fahrenheit, in Newport Bight, Cruise STIRNI - III, January - February, 1952.

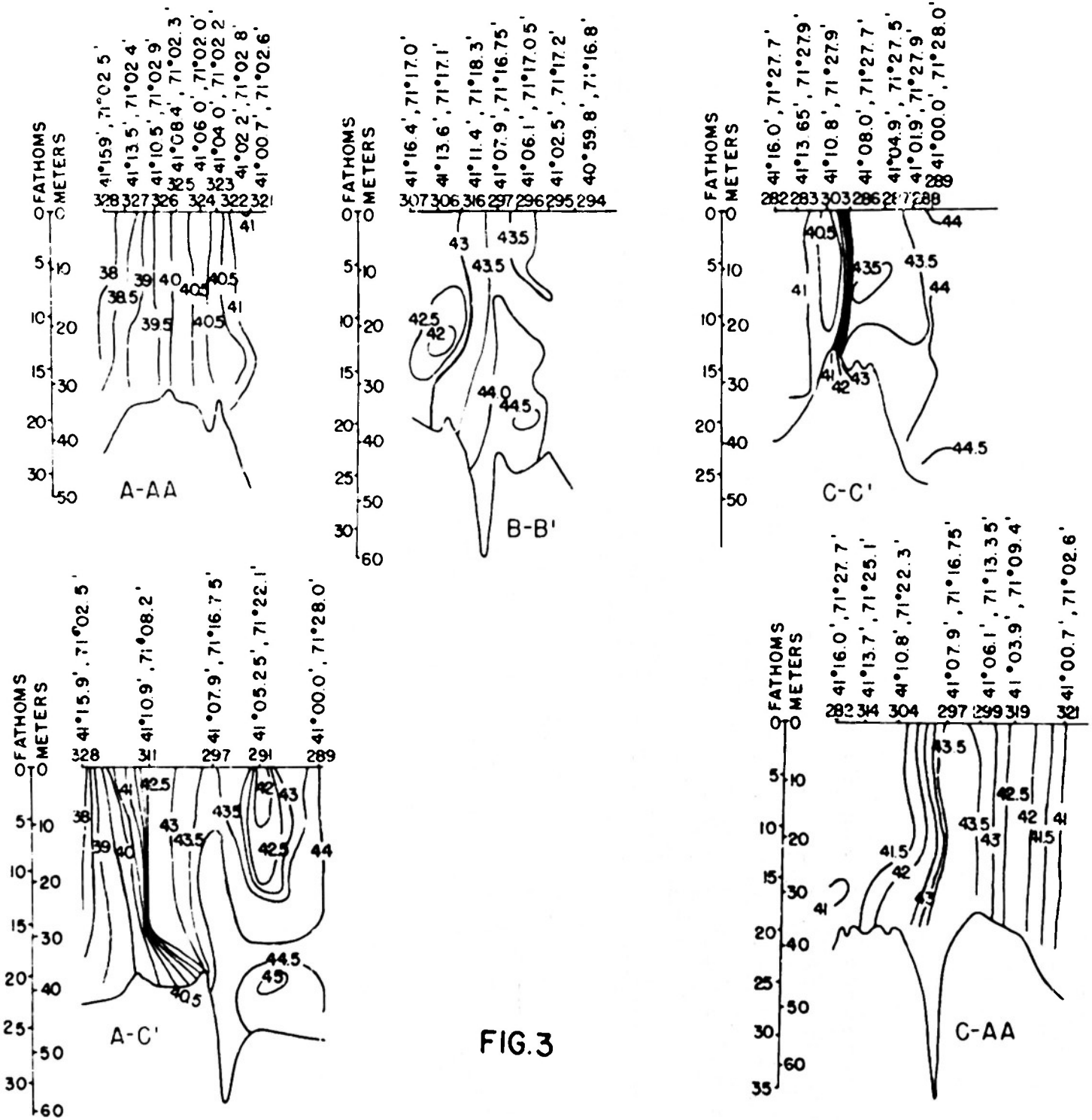


FIG.3

Legend

Figure 4. Vertical Distribution of Temperature, degrees Fahrenheit, in Block Island Sound, Cruise STIMNI - III, January - February, 1952.

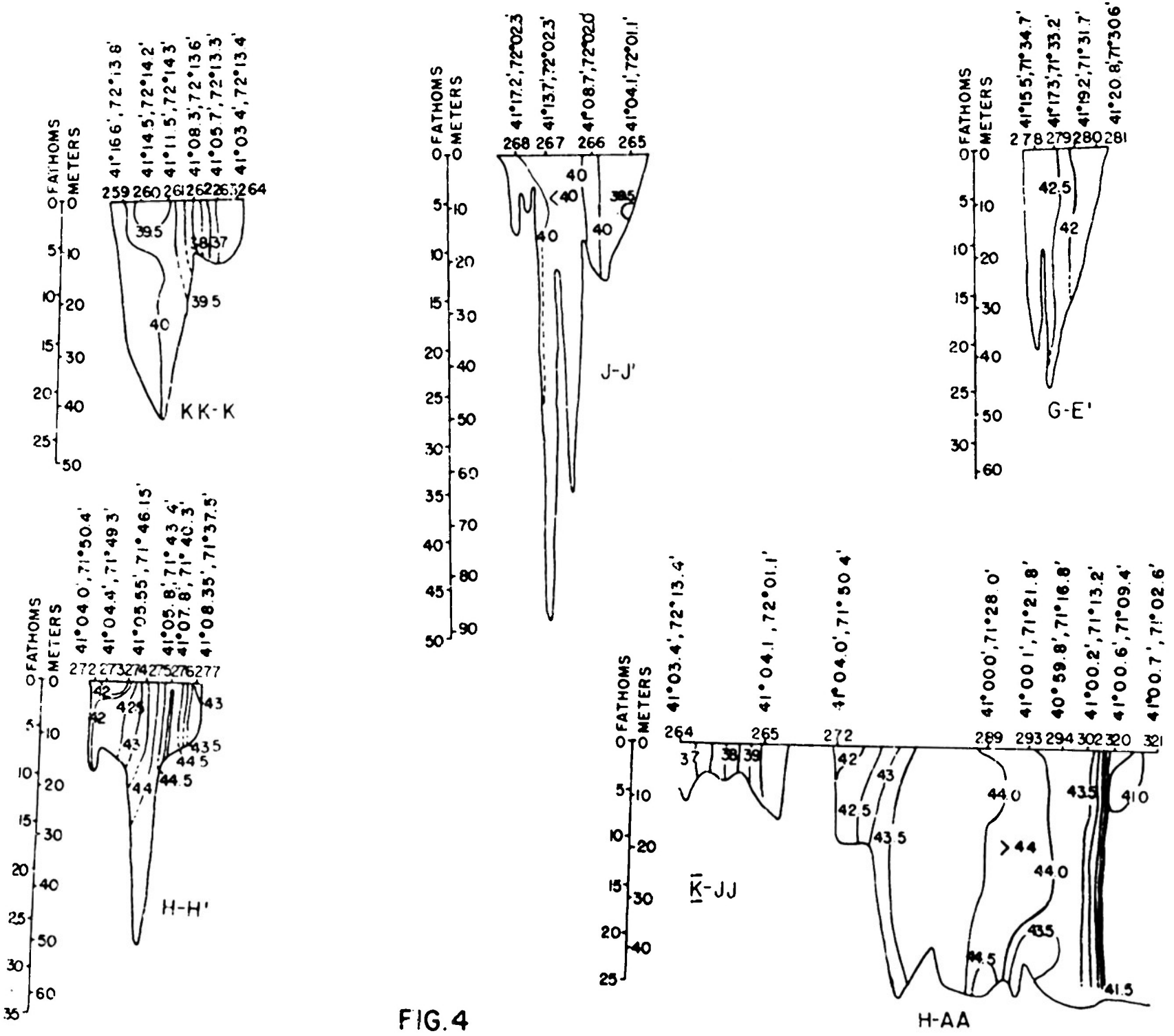

FATHOMS
METERS
41°16.6', 72°13.8'
41°14.5', 72°14.2'
41°11.5', 72°14.3'
41°08.3', 72°13.6'
41°05.7', 72°13.3'
41°03.4', 72°13.4'
259 260 261 262 263 264
KK-K
41°17.2', 72°02.3'
41°13.7', 72°02.3'
41°08.7', 72°02.0'
41°04.1', 72°01.1'
268 267 266 265
J-J'
41°15.5', 71°34.7'
41°17.3', 71°33.2'
41°19.2', 71°31.7'
41°20.8', 71°30.6'
278 279 280 281
G-E'
41°04.0', 71°50.4'
41°04.4', 71°49.3'
41°03.55', 71°46.15'
41°05.8', 71°43.4'
41°07.8', 71°40.3'
41°08.35', 71°37.5'
272 273 274 275 276 277
H-H'
41°03.4', 72°13.4'
41°04.1, 72°01.1'
41°04.0', 71°50.4'
41°00', 71°28.0'
41°00.1', 71°21.8'
40°59.8', 71°16.8'
41°00.2', 71°13.2'
41°00.6', 71°09.4'
41°00.7', 71°02.6'
264 265 272 289 293 294 302 320 321
IK-JJ
H-AA

FIG. 4

Legend

Figure 5. Vertical Distribution of Temperature, degrees Fahrenheit, in Long Island Sound, Cruise STIRNI - III, January - February, 1952.

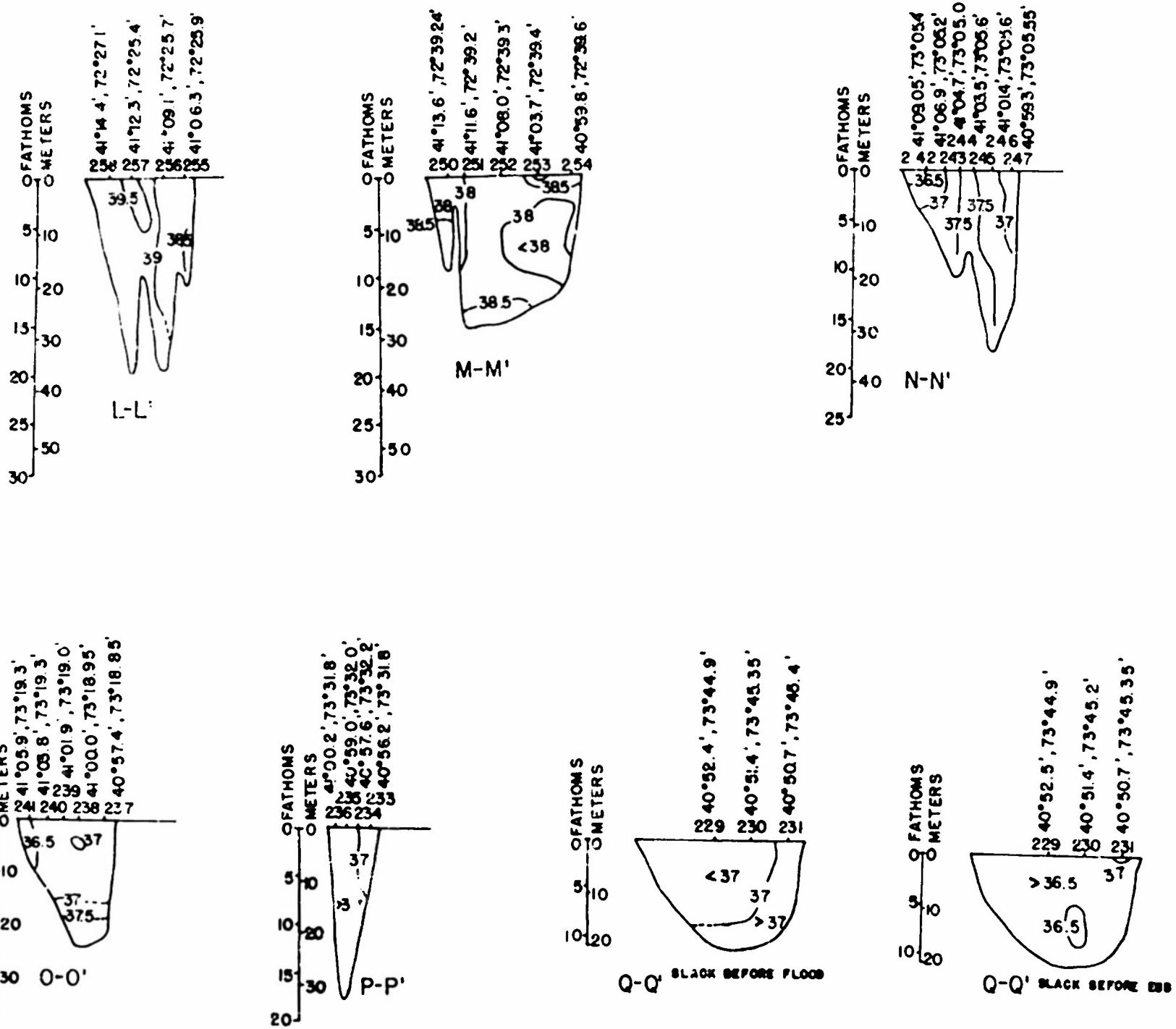
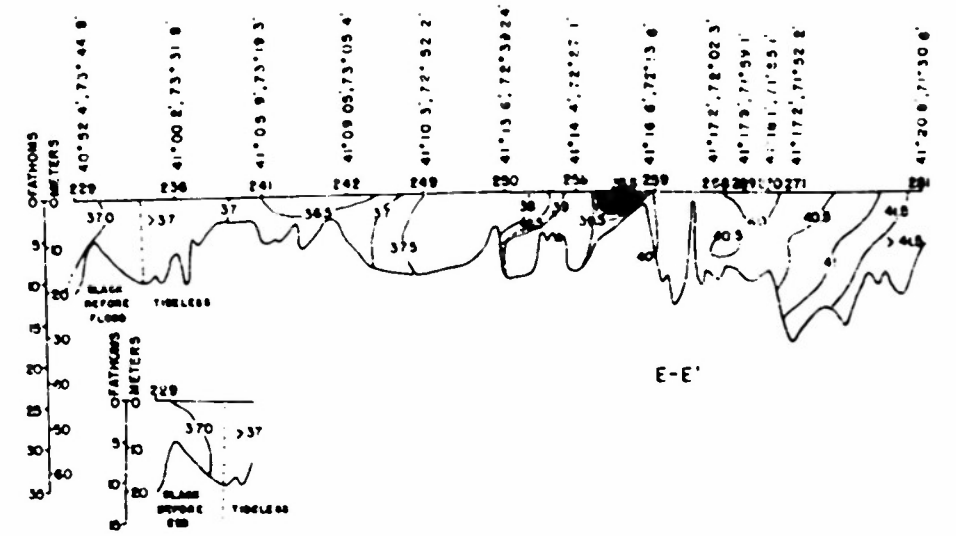
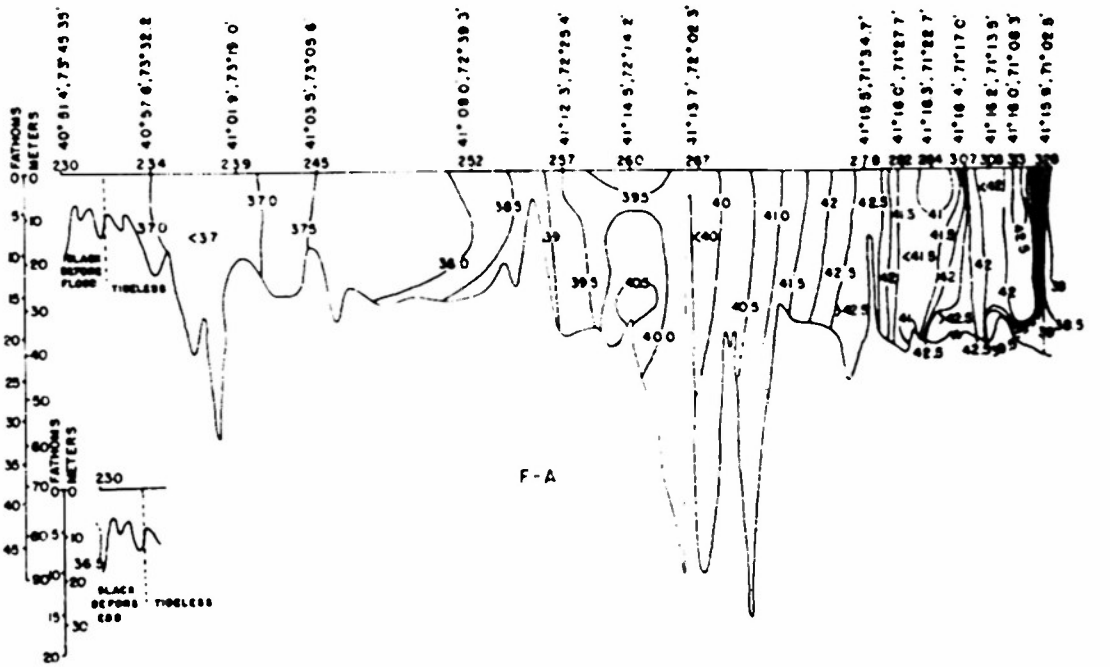

FATHOMS
METERS
L-L'
M-M'
N-N'
O-O'
P-P'
Q-Q' BLACK BEFORE FLOOD
Q-Q' BLACK BEFORE EBB

FIG. 5

Legend

Figure 6. Vertical Distribution of Temperature, degrees Fahrenheit; Profiles Constructed Across Entire Area Covered by Cruise STIRMI - III, January - February, 1952.


FATHOMS
METERS
BLACK
BEFORE
FLOOD
TIDELESS
E-E'


FATHOMS
METERS
BLACK
BEFORE
FLOOD
TIDELESS
F-A

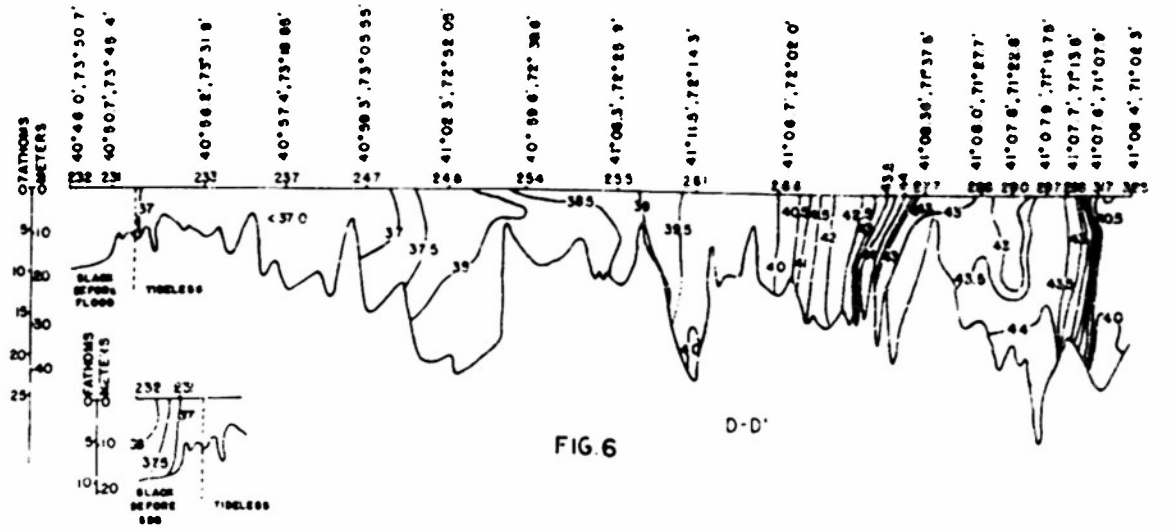

FATHOMS
METERS
BLACK
BEFORE
FLOOD
TIDELESS
D-D'

FIG. 6